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Final Report

Constructing Scientific Applications from Heterogeneous Resources

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Grant NCC3374, November 16, 1994 - November 17, 1995

This project investigated a new model for high-performance scientific applications in which such applications are implemented as heterogeneous distributed programs or, equivalently, meta-computations. With this approach, an application is constructed from a distributed collection of component codes executing on a variety of heterogeneous machines spanning both short- and long-haul networks. A software interconnection system called Schooner is then used to connect the components together into a single program, and to provide support for configuration and execution control over the resulting computation. The system supports a variety of languages (e.g., C, Fortran), machines (e.g., Cray, Intel Paragon, IBM SP-2, Sun, SGI), visualizers (e.g., AVS), and message-passing libraries (e.g., PVM, APPL).

The specific focus of this grant was a collaborative effort with researchers at NASA and the University of Toledo to test and improve Schooner, and to explore the benefits of increased user interaction with executing scientific applications. The work was performed in the context of the Numerical Propulsion System Simulation (NPSS) project, and in particular, its effort to integrate new engine codes into an overall simulation. Patrick Homer, the postdoctoral associate supported by this grant, was in residence at NASA Lewis Research Center to pursue this research from May 29 to August 17, 1995.

Below are citations for papers and reports whose preparation was supported in some way by this grant. In addition, project personnel:

- Participated in the Heterogeneous Computing Challenge at Supercomputing '94 in Washington, D.C.
- Demonstrated Schooner at the 4th IEEE Symposium on High Performance Distributed Computing in Washington, D.C., 1995.
- Designed and staffed a research exhibit at the Supercomputing '95 conference in San Diego.

References

P. Homer. *Constructing Scientific Applications from Heterogeneous Resources*. PhD Dissertation, Technical Report 94-33, Department of Computer Science, University of Arizona, December 1994.

A. Afjeh, P. Homer, H. Lewandowski, J. Reed and R. Schlichting. Development of an Intelligent Monitoring and Control System for a Heterogeneous Numerical Propulsion System Simulation. *Proceedings 28th Annual Simulation Symposium*, Phoenix AZ, (April 1995), 278-287.

P. Homer and R. Schlichting. Constructing Scientific Meta-computations. *Proceedings HPC Asia '95*, Taipei Taiwan, (September 1995).

P. Homer and R. Schlichting. Configuring Scientific Applications in a Heterogeneous Distributed System. *Distributed Systems Engineering* (1996), to appear.